CHARLES DARWIN UNIVERSITY

ETL123

Tutorial 3

Discussion questions

1. What is the difference between teaching *for*, *about* and *through* problem solving? Can you identify these approaches in your own mathematics learning at school or in teaching that you have seen in professional experience?
2. Watch the video of John Van de Walle teaching a group of teachers through problem solving on MyEducationLab. How do you react to his statement that "correctness comes from the mathematics, never the teacher"? What is the role of the teacher in teaching through problem solving?
3. On page 37 Van de Walle discusses the use of children's literature as a source of mathematical problems. One of the books suggested is *The Doorbell Rang* by Pat Hutchins. Obtain a copy of the book or listen to it being read from the link on Learnline. When you have read or listened to the book think about how you might a structure a "mathematics *through* problem solving" lesson based on the book. Now look at a lesson plan based on the book at http://www.lessonplanspage.com/MathLAMultiplicationDivisionUsingTheDoorbellRang23.htm . What do you think of this as an approach (you may wish to use the four-step approach to evaluating an activity on p39)? How much of this lesson plan incorporates open questions, such as those in the readings by Sullivan and Bills? Who does the thinking in this lesson plan?

Open questions

The following is a selection of open-ended questions such as those in the book *Open-ended Maths Activities* by Sullivan and Lilburn. Try each question, in each case finding at least one interesting or unusual answer. For each question state what you think the closed question from which it was derived may have been.

1. What could you add to 361 to make it divisible by 10?

2. In my pocket I have 75 cents. What coins might I have?

3. A friend of mine put these fractions into two groups, but they got mixed up. What might the two groups have been?

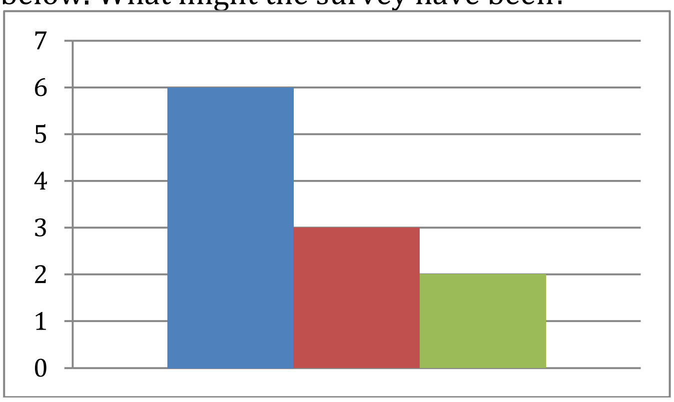
$\frac{2}{5}$ $\frac{6}{10}$ $\frac{1}{10}$

$\frac{3}{4}$ $\frac{1}{3}$

4. How many different ways can you make your calculator show 12.34 without pressing the decimal point button?
5. A number has been rounded off to 1200. Might the number be?
6. What can you find that is bigger than a potato but lighter than it?
7. What are there exactly five of in this room?
8. Make a box using exactly 24 unit cubes.
9. What are your three favourite times of the day? Show where they fit on a timeline of your day.
10. Draw something 40cm long that fits into this box.

11. What are some tings in this room that you can go under?
12. Tony was pulling a shape from a box. When he had pulled it part way out it looked like this. What shape might it have been?

13. My older sister was talking to my dad and asked him a question. His answer was “more likely than not”. What might the question have been?
14. I did a survey of my grade 3 class. The results are shown in the graph below. What might the survey have been?



Thinkers

The following questions are adapted from *Thinkers*, by Bills et.al.

Activity 1: Pointing toward generality (particular, peculiar, general)

These questions are intended to guide students towards developing generalisations, which is at the heart of mathematical thinking. As an example try the following exercise:

- Give me an example of a fraction that is equivalent to $\frac{2}{3}$.
- Give me a really peculiar example.
- Give me a general example.

In answering these questions students might first give the fraction $\frac{4}{6}$. To find a peculiar example they may give an answer such as $\frac{2000}{3000}$. Other students might use decimals, or irrational numbers such as $\frac{2\pi}{3\pi}$. This helps them to realise that the numerator and denominator can be multiplied by any number. So a general example might be a written explanation such as "2 times any number over 3 times the same number", or students may express it as $\frac{2a}{3a}$.

Some to try

Give a particular, peculiar and general example of:

1. An even number
2. A number with exactly three factors
3. A number which leaves a remainder of 1 when divided by 3
4. A parallelogram
5. A fraction with decimal equivalent 0.2
6. An equation with solution $x = 3$
7. A shape with exactly two lines of symmetry
8. An event with probability ½

Activity 2: Always, sometimes, never true

This activity focuses attention on the conditions required for a statement to be true. Students can make generalisations about whether something is true or not and find specific conditions that will make a statement true.

For example, the statement might be "Addition makes a number bigger". This is sometimes true. If the addend is 0, the number remains unchanged, but if the addend is smaller the number decreases.

Some to try

1. Are these statements always, sometimes or never true?
2. A number in the 5 times table ends in 5
3. The sum of two numbers smaller than 10 is a number smaller than 20.
4. An odd number plus an odd number is another odd number.
5. Rectangles with the biggest areas have the biggest perimeters.
6. A square is a rectangle.
7. Squaring a number makes it larger.
8. The mean of a set of numbers is equal to the median.